

**What is claimed is:**

1           1.    An I/O circuit placement method for placing I/O  
2           circuits included in a semiconductor device, comprising a step  
3           of:

4                placing at least two rows of I/O circuits on a first side  
5                of a chip, wherein each I/O circuit has a head  
6                section and a tail section, the placement direction  
7                of the head section and the tail section is  
8                perpendicular to that of the I/O circuits in the  
9                rows.

1           2.    The placement method as claimed in claim 1 further  
2           comprises a step of placing another row of I/O circuits on  
3           a second side of the chip.

1           3.    The placement method as claimed in claim 1, wherein  
2           the head sections are oriented to the tail sections in the  
3           adjacent rows.

1           4.    The placement method as claimed in claim 1, wherein  
2           the head sections are oriented to the head sections in the  
3           adjacent rows.

1           5.    The placement method as claimed in claim 1, wherein  
2           a different number of I/O circuits are placed in different  
3           rows.

1           6.    A semiconductor device, comprising:  
2           a chip; and  
3           at least two rows of I/O circuits placed on a first side  
4           of the chip, wherein each I/O circuit has a head

5 section and a tail section, the placement direction  
6 of the head section and the tail section is  
7 perpendicular to that of the I/O circuits in the  
8 rows.

1 7. The semiconductor device as claimed in claim 6,  
2 further comprising another row of I/O circuits placed on a  
3 second side of the chip.

1 8. The semiconductor device as claimed in claim 6,  
2 wherein the head sections are oriented to the tail sections  
3 in the adjacent rows.

1 9. The semiconductor device as claimed in claim 6,  
2 wherein the head sections are oriented to the head sections  
3 in the adjacent rows.

1 10. The semiconductor device as claimed in claim 6,  
2 wherein the tail sections are oriented to the tail sections  
3 in the adjacent rows.

1 11. The semiconductor device as claimed in claim 6,  
2 further comprising a core circuit region disposed on the chip,  
3 wherein the rows of I/O circuits are disposed outside the core  
4 circuit region and are at the periphery of the chip.

1 12. The semiconductor device as claimed in claim 6,  
2 wherein the number of the I/O circuits placed in the different  
3 rows is different.

1 13. A semiconductor device, comprising:  
2 a chip;  
3 a core circuit region disposed on the chip;

4 a loop of I/O circuits disposed at the periphery of the  
5 chip and around the core circuit region; and  
6 at least one row of I/O circuits disposed between the  
7 loop of I/O circuits, wherein each I/O circuit has  
8 a head section and a tail section, the placement  
9 direction of the head section and the tail section  
10 is perpendicular to that of the I/O circuits in the  
11 loop or the row.

1 14. The semiconductor device as claimed in claim 13,  
2 wherein the head sections are oriented to the tail sections  
3 in the adjacent rows.

1 15. The semiconductor device as claimed in claim 13,  
2 wherein the head sections are oriented to the head sections  
3 in the adjacent rows.

1 16. The semiconductor device as claimed in claim 13,  
2 wherein the tail sections are oriented to the tail sections  
3 in the adjacent rows.